III.7-PXPP PRELIMINARY PRECIPITATION PROCESSING PROGRAM (PXPP)

Purpose

The Preliminary Precipitation Processing Program (PXPP) is used to
analyze station precipitation data that can then be used to develop a
Mean Areal Precipitation (MAP) estimate using program MAP (see Chapter
III.7-MAP).

Chapter III.2 describes how to obtain the historical station
precipitation data.

Program PXPP works with monthly totals rather than the individual
hourly and daily precipitation values that are processed by MAP. Thus
the computations can be performed much quicker. Working with monthly
totals is fully adequate in most cases for performing preliminary
analysis to check and correct for data inconsistencies and determine
inter-station relationships. The one unique function of program PXPP
is the ability to compute mean monthly precipitation values in a
consistent manner for stations with varying periods of record. Good
estimates of long term means are essential to generating good
estimates of MAP in mountainous areas.

Program PXPP includes methods to:

  1. Estimate missing precipitation amounts (the program uses the
     1/D**2 method to estimate missing monthly precipitation where
     station coordinates used to calculate the distance are input as
     degrees of latitude and longitude and then converted to polar
     stereographic coordinates).

  2. Calculate and print the correlation of each station with all
     other stations. These correlations can be calculated on an
     annual or a seasonal basis.

  3. Correct the precipitation of individual stations for
     inconsistencies occurring during the time period analyzed.
     Inconsistencies are generally the result of a change in station
     location or instrumentation. The corrections are determined by
     examining a consistency plot which can be done on either an
     annual or a seasonal basis.

  4. Produce the input data set for program MAP. This data set will
     generate an MAP run that can be used to verify the consistency
     corrections using hourly and daily values rather than the
     monthly totals used by program PXPP. No areas are included in
     the MAP data set. Station order in the MAP data set will be
     different than the PXPP data set because the hourly stations are
     placed before daily stations to be consistent with MAP input
     requirements. The MAP data set is complete except for
     observation times which must be added before running the MAP
     program.

  5. Analyze up to 200 stations and 100 years of data.

6. Input a maximum of ten precipitation adjustment factors in
   chronological order for each station.

7. Input the latitude and longitude in decimal degrees or in
   degrees, minutes and seconds.

8. Print the dates for the station with the least deviation from
   the mean of the 5 stations in each consistency plot. The plots
   of each set of 5 stations can also be turned off if they are no
   longer needed. The monthly summaries of precipitation data for
   individual stations can also be suppressed.

Background

Program PXPP uses monthly precipitation at each station as a basis for
analysis rather than daily and hourly values. Monthly totals are
calculated from daily and hourly data, but if data for any day or hour
is missing during a given month, that month is treated as missing
data. The most prevalent observation time is used to determine
monthly totals for the hourly data that correspond to those available
for most of the daily data stations.

The method used to compute mean monthly values for all stations relies
on determining the relationship between each station and a common base
station. The base station is selected based on the completeness of
record during the period of analysis and how representative
precipitation at that station is of precipitation over the entire area
being analyzed. Then monthly ratios of total precipitation at each
station to total precipitation at the base station are calculated. It
should be noted that the precipitation totals include only data for
months where neither the base station nor the station being compared
to the base has missing data. These monthly ratio to base values are
then used to estimate missing data and to compute monthly means.

The other aspect of the data estimation process is the weighting of
the stations surrounding the station with missing data. A 1/d**2
method is used. The distance d is calculated from polar stereographic
coordinates for each station which were derived from latitude and
longitude coordinates. The nearest station in each quadrant
surrounding the station whose data is to be estimated is then given a
weight of 1/d**2. Only stations with observed data are used as
estimators.

The equation used to estimate missing data is as follows:

$$P_{x,m} = \frac{\displaystyle\sum_{i=1}^{N} P_{i,m} * \frac{R_{x,m}}{R_{i,m}} * \left(\frac{1}{d_{x,i}}\right)^2}{\displaystyle\sum_{i=1}^{N} \left(\frac{1}{d_{x,i}}\right)^2}$$

   where P is precipitation total
         R is ratio to base station

```
d is distance
x is the station being estimated
i is the estimator station
m is the month being estimated
n is the total number of estimators (maximum is 4)
```

Program PXPP provides information about the quality of the estimation
procedure by computing some statistics for each station. The
statistics are the root mean squared (RMS) error and the overall bias
of the estimate. The statistics are generated by comparing estimated
totals to observed values for all of the months that have complete
data.

Mean precipitation can be computed in two ways. One method is to
compute the average for each month using observed totals for all years
with complete data and estimated totals for the other years. These
are the values displayed in the summary table output from program
PXPP. The second method involves multiplying the ratio to base for
each month times the base station mean (base station mean computed by
the first method). This method cannot be used for the base station
(the base station should have very few months with estimated data).
Both methods produce very similar results. The second method is used
to produce the G card values that can be included in the MAP output
file produced by program PXPP.

Mean monthly precipitation values should be used in MAP computations
when there are significant variations in long term means between
stations. If mean monthly values are not going to be used
operationally then they should not be used in the MAP program.

Inconsistencies in station data are checked by using a double mass
analysis. A double mass analysis compares the accumulation at an
individual station against the average accumulation for a group of
other stations. If the station's data are consistent then the double
mass plot should be close to a straight line. Minor deviations or
wobbles about a straight line are due to natural variations in
precipitation over the area. Sudden shifts in the slope of the line
indicate inconsistencies. The consistency plot generated by program
PXPP displays the double mass analysis by plotting the deviation of
each station from the group mean against the base or average
accumulation for the group. A maximum of 5 stations are included on a
plot. A complete record is needed in order to perform a double mass
analysis therefore estimated values are used for all months containing
missing data. Corrections derived from the consistency plots are only
applied to months with a complete data record.

The effect of varying seasonal relationships between stations, which
are common in many mountainous areas, are removed before correlation
coefficients are computed. This is done by dividing the monthly
precipitation totals by the ratio to base for the month prior to
computing the correlations. Only months with complete observed data
are used in computing the correlations (i.e. no estimated values are
used).

Input Format

The program uses fixed format for all cards.

Character input must be left justified (e.g., 'IN ' and not ' IN' in an A4 format) in the input field.

Integers must be right justified in the input field.

Input Data

Card	Field	Format	Columns	Contents
PERIOD OF RECORD AND INPUT OPTIONS				
A	1	I5	1-5	First month
	2	I5	6-10	First year (four digits)
	3	I5	11-15	Last month
	4	I5	16-20	Last year (four digits)
	5	2X,A8	23-30	Base station identifier
	6	2X,A4	33-36	Latitude/Longitude units; default is decimal degrees: 1/ 'DGMS' = degrees, minutes and seconds
	7	2X,I2	39-40	Most prevalent observation time for the daily stations (hours 1 through 24)
	8	1X,A4	42-45	Units of station elevations ('FT' or 'M')
	9	I5	46-50	First month of winter
	10	I5	51-55	First month of summer
OUTPUT OPTIONS				
B	1	A4	1-4	Calculate and print correlation tables showing correlation of each station to every other station in the analysis: 2/ 'NONE' = no tables printed 'YEAR' = correlation calculated on an annual basis and printed 'SEAS' = correlation calculated on a seasonal basis and printed

Card	Field	Format	Columns	Contents
	2	1X,A4	6-9	Consistency plot print option: 2/ 'NONE' = do not print any consistency plots 'YEAR' = consistency plots on an annual basis 'SEAS' = consistency plots on a seasonal basis
	3	1X,A4	11-14	Option to print the date on consistency plots; the date printed will be for the station closest to the mean of the 5 stations in the plot ('YES' or 'NO') 3/
	4	1X,A4	16-19	Option to print the monthly summaries of precipitation data and estimates of missing data for all stations ('YES' or 'NO')
	5	1X,A4	21-24	Precipitation units for displays ('IN' or 'MM')
	6	5X,I1	30	Option to output MAP input data cards: 1 = output 0 = do not output
	7	4X,I1	35	Option to include mean monthly precipitation values in the MAP punch output (card G): 1 = include 0 = do not include

Repeat cards C and D for each station.

STATION INFORMATION

Card	Field	Format	Columns	Contents
C	1	A8	1-8	Station identifier
	2	3X,F8.4	12-19	Latitude
	3	1X,F8.4	21-28	Longitude
	4	2X,F6.0	31-36	Elevation (units of M or FT)
	5	2X,I2	39-40	Time interval of station precipitation measurement: 1 = hourly station 24 = daily station
	6	4X,A4	45-48	Type of external file; default is 'CALB'

Card	Field	Format	Columns	Contents
	7	4X,5A4	53-72	Station description

STATION TIME SERIES INPUT FILE INFORMATION

Card	Field	Format	Columns	Contents
D				Repeat card D for each time series 4/
E	1		1-8	'ENDSTAN'

STATION CONSISTENCY CORRECTIONS

Card F is needed only if consistency corrections are to be entered.

Repeat card F for stations with more than 5 corrections and for each station with corrections.

Card	Field	Format	Columns	Contents
F	1	A8	1-8	Station identifier of station being corrected
	2	2X,I3	13-15	Number of corrections for that station (corrections must be input in chronological order)
	3	5X,I2	21-22	Month of correction number 1
	4	1X,I2	24-27	Year of correction number 1 (4 digits)
	5	A1	28	Season indicator of correction number 1: 'W' = apply to winter months 'S' = apply to summer months blank = apply to all months
	6	F4.2	29-32	Correction factor 1
	6+	F4.2	33-44	Month, year, season indicator and correction factor for correction number 2
		F4.2	45-56	Month, year, season indicator and correction factor for correction number 3
		F4.2	57-68	Month, year, season indicator and correction factor for correction number 4
		F4.2	69-80	Month, year, season indicator and correction factor for correction number 5

Card	Field	Format	Columns	Contents
G	1		1-8	'ENDCORR'

Cards H and I are only needed if consistency plots are to be produced.

CONSISTENCY PLOT OPTIONS

H	1	I5	1-5	Number of groups to plot (maximum is 3)
	2-6	5I5	6-30	Number of stations in each group

CONSISTENCY PLOT CONTENTS

Repeat card I for all stations in the group (last card may have less than 5 stations). Repeat card I for the other groups.

I	1-5	5(A8,2X)	1-50	Station identifiers for 5 stations in the group to be included in the same plot
	6	A4	51-54	Option to print the consistency plot for these stations ('YES' or 'NO')

Notes:

1/ The station location can be input in decimal degrees or degrees, minutes and seconds. If DGMS is specified then the location is input with the minutes and seconds located to the right of the decimal point. For example 106 degrees 45 minutes 30 seconds would be input as 106.4530 in minutes and seconds and 106.7583 in decimal form. If minutes and seconds are used then two characters must always be used to specify both the minutes and seconds. For example 45 degrees 9 minutes 2 seconds would be 45.0902.

2/ The correlation table option enables the calculation of station correlations on the basis of the entire year or on the basis of the seasons defined by the first month of winter and the first month of summer. The consistency option will display consistency plots for the entire year or by season for each station indicated. Development of the correlation tables and consistency plots by season is recommended for basins where snow dominates in one season and rain in the other or where the dominant precipitation mechanism (e.g., orographic, convective) varies with time of the year.

3/ If consistency plots are printed then this option will print the date of the station nearest to the mean of the 5 stations being plotted on that page. This date will be fairly uniform for all 5 stations in the plot if the variability between mean precipitation for the stations is small. When the variation in means for the 5 stations is significant, the table preceding the plot must be used to determine the date associated with the data values for all

except the specified station.

4/ Name of file containing the station time series data. See Chapter
I.2-UNIX-UNIX for a description of the directory structure.

Program Execution Information

See Chapter I.2 for information about how to execute the program.

Sample Input and Output

Figure 1 is sample program input.

Figure 2 is sample program output.

Figure 1. Sample input for program PXPP

```
          10        20        30        40        50        60        70        80
----+----+----+----+----+----+----+----+----+----+----+----+----+----+----+----+
    10 1959    9 1961  NC1055D          8 FT     10    5
NONE YEAR NO   YES  IN      1    1
NC7035H    35.17     82.89     2600.   1              QUEBEC, NC-HLY
Quebec_NC
NC3492H    35.27     82.84     3120.   1              GLOUCESTER GAP, NC
GloucesterGap_NC
NC6778H    35.33     82.78     3285.   1              PINK BEDS, NC-HLY
PinkBeds_NC
NC1614H    35.15     83.65     2750.   1              CEDAR MTN, NC
CedarMtn_NC
NC3925H    35.30     82.91     5400.   1              HAYWOOD GAP, NC
HaywoodGap_NC
NC1055D    35.23     82.73     2155.   24             BREVARD, NC
Brevard_NC
NC6499D    35.20     82.98     3520.   24             OWENS GAP, NC
OwensGap_NC
NC6805D    35.27     82.70     2110.   24             PISGAH FOREST 1N, NC
PisgahForest1N_NC
NC7486D    35.24     82.83     2220.   24             ROSMAN, NC
Rosman_NC
SC7737D    35.06     82.77     3500.   24             SASSAFRASS MTS, SC
SassafrassMtn_SC
ENDSTAN
NC7486D       1       7/1960  .87
ENDCORR
    1   10
NC7035H    NC3492H    NC6778H    NC1614H    NC3925H    YES
NC1055D    NC6499D    NC6805D    NC7486D    SC7737D    YES
```

Figure 2. Sample output from program PXPP

```
NWSRFS CALIBRATION SYSTEM - PROGRAM PXPP     (VERSION: 1.1.8   - 01/20/99)              DATE=Feb 24, 1999 - 07:52:15

            SUMMARY OF PXPP INPUT PARAMETERS AND STATION INFORMATION

      BASE        MOST PREVALENT     PRINT MONTHLY      UNITS FOR        UNITS FOR
    STATION        OBSERVATION      SUMMARIES FOR     PRECIPITATION      ELEVATION
   IDENTIFIER         TIME           EACH STATION                          INPUT
  ------------   ----------------   ---------------   ---------------    ---------
    NC1055D         8:00 HOURS           YES               IN               FT

     PRINT          FIRST              FIRST              NUMBER        LAT/LONG IN
  CORRELATION     MONTH OF           MONTH OF              OF             MINUTES
    TABLES         WINTER             SUMMER            STATIONS        AND SECONDS
  --------------  ----------         ----------         ----------      -----------
     NONE           OCT.               MAY                 10               NO

   PRINT DATE     CONSISTENCY         PRODUCE           INCLUDE      USE MULTIPLE
  ON CONSISTENCY     PLOT            MAP3 INPUT        @G CARD IN    CALIBRATION
     PLOT          OPTION            DATA SET          MAP3 INPUT       FILES
  --------------  -------------      ----------        ----------    ------------
     NO             YEAR               YES                YES            NO

     PERIOD OF RECORD:  10/1959 THROUGH  9/1961

  STATION     DESCRIPTION              LATITUDE    LONGITUDE   ELEVATION    TIME      EXTERNAL
  NAME                                                        (FT  )     INTERVAL   FILE TYPE
  --------    -----------              --------    ---------   ---------   --------   ---------
  NC7035H     QUEBEC, NC-HLY            35.17       82.89       2600.0        1         CALB
  NC3492H     GLOUCESTER GAP, NC        35.27       82.84       3120.0        1         CALB
  NC6778H     PINK BEDS, NC-HLY         35.33       82.78       3285.0        1         CALB
  NC1614H     CEDAR MTN, NC             35.15       83.65       2750.0        1         CALB
  NC3925H     HAYWOOD GAP, NC           35.30       82.91       5400.0        1         CALB
  NC1055D     BREVARD, NC               35.23       82.73       2155.0       24         CALB
  NC6499D     OWENS GAP, NC             35.20       82.98       3520.0       24         CALB
  NC6805D     PISGAH FOREST 1N, NC      35.27       82.70       2110.0       24         CALB
  NC7486D     ROSMAN, NC                35.24       82.83       2220.0       24         CALB
  SC7737D     SASSAFRASS MTS, SC        35.06       82.77       3500.0       24         CALB
                     MAP PRELIMINARY COMPUTATIONS.

MEAN MONTHLY AND MEAN ANNUAL PRECIPITATION PLUS MONTHLY RATIO TO BASE STATION.

PERIOD ANALYZED IS 10/1959 TO  9/1961.     NC1055D  IS THE BASE STATION.     UNITS ARE IN

OCT. IS THE FIRST MONTH OF WINTER.     MAY  IS THE FIRST MONTH OF SUMMER.

CORRECTION FACTORS USED ARE AS FOLLOWS.     W INDICATES WINTER ONLY, S INDICATES SUMMER ONLY.

STATION I.D. CODE        CORRECTIONS AND MONTH WHEN FIRST APPLIED.

     NC7486D    7/1960    .87

STATION WEIGHTS BASED ON 1.0/DISTANCE SQUARED.

STATION   1       QUEBEC, NC-HLY               I.D.= NC7035H    LAT= 35.17    LONG= 82.89    ELEVATION= 2600. FT

MONTH                   1      2      3      4      5      6      7      8      9     10     11     12    ANNUAL
YEARS USED              2      2      2      2      2      2      2      2      2      2      2      2
RATIO TO BASE         .97   1.12   1.00   1.13    .95    .85    .96    .92   1.35    .93   1.49   1.04
MEAN PRECIPITATION   4.66   9.98   6.34   5.60   3.74   7.27   6.22  13.36   4.73   8.09   2.19   3.69    75.87
SEASONAL PRECIP.              OCT.-APR.= 40.55          MAY -SEPT= 35.32
RMS ERROR OF ESTIMATION PROCEDURE BASED ON MONTHS WITH VALID DATA IS    .98 IN      BIAS=    .0 %

STATION   2       GLOUCESTER GAP, NC          I.D.= NC3492H    LAT= 35.27    LONG= 82.84    ELEVATION= 3120. FT

MONTH                   1      2      3      4      5      6      7      8      9     10     11     12    ANNUAL
YEARS USED              2      2      2      2      2      2      2      2      2      2      2      2
RATIO TO BASE        1.34   1.16   1.10   1.02   1.19   1.25    .64   1.02   1.06   1.17   1.97   1.15
MEAN PRECIPITATION   6.48  10.32   6.96   5.04   4.70  10.63   4.16  14.75   3.69  10.16   2.90   4.08    83.84
SEASONAL PRECIP.              OCT.-APR.= 45.92          MAY -SEPT= 37.92
RMS ERROR OF ESTIMATION PROCEDURE BASED ON MONTHS WITH VALID DATA IS   1.32 IN      BIAS=    .3 %

STATION   3       PINK BEDS, NC-HLY           I.D.= NC6778H    LAT= 35.33    LONG= 82.78    ELEVATION= 3285. FT

MONTH                   1      2      3      4      5      6      7      8      9     10     11     12    ANNUAL
YEARS USED              2      2      2      2      2      2      2      2      2      2      2      2
RATIO TO BASE        1.14   1.05   1.12    .94   1.12    .85    .75    .87   1.04   1.13   1.68   1.03
MEAN PRECIPITATION   5.49   9.36   7.14   4.66   4.43   7.27   4.86  12.63   3.62   9.80   2.47   3.66    75.38
SEASONAL PRECIP.              OCT.-APR.= 42.58          MAY -SEPT= 32.80
RMS ERROR OF ESTIMATION PROCEDURE BASED ON MONTHS WITH VALID DATA IS    .52 IN      BIAS=    .0 %

STATION   4       CEDAR MTN, NC               I.D.= NC1614H    LAT= 35.15    LONG= 83.65    ELEVATION= 2750. FT

MONTH                   1      2      3      4      5      6      7      8      9     10     11     12    ANNUAL
YEARS USED              2      1      2      2      2      2      2      2      2      2      1      2
RATIO TO BASE        1.23   1.29   1.17   1.22   1.33    .99    .79   1.10   1.06   1.19   2.67   1.31
MEAN PRECIPITATION   5.94  11.75   7.44   6.03   5.28   8.47   5.10  15.85   3.71  10.35   3.42   4.64    87.96
SEASONAL PRECIP.              OCT.-APR.= 49.57          MAY -SEPT= 38.40
RMS ERROR OF ESTIMATION PROCEDURE BASED ON MONTHS WITH VALID DATA IS   1.12 IN      BIAS=    .3 %

STATION   5       HAYWOOD GAP, NC             I.D.= NC3925H    LAT= 35.30    LONG= 82.91    ELEVATION= 5400. FT

MONTH                   1      2      3      4      5      6      7      8      9     10     11     12    ANNUAL
YEARS USED              2      2      2      2      2      2      2      2      2      1      2      2
RATIO TO BASE        1.56   1.24   1.23   1.27   1.45    .93   1.19    .82   1.22    .92   2.56   1.36
MEAN PRECIPITATION   7.54  11.04   7.83   6.29   5.74   7.90   7.55  11.91   4.25   9.17   3.77   4.85    87.81
SEASONAL PRECIP.              OCT.-APR.= 50.47          MAY -SEPT= 37.34
RMS ERROR OF ESTIMATION PROCEDURE BASED ON MONTHS WITH VALID DATA IS   1.13 IN      BIAS=  -1.4 %
```

Figure 2. Sample output from program PXPP (continued)

```
STATION   6        BREVARD, NC                      I.D.= NC1055D    LAT= 35.23    LONG=  82.73     ELEVATION=  2155. FT

MONTH                  1       2       3       4       5       6       7       8       9      10      11      12    ANNUAL
YEARS USED             2       2       2       2       2       2       2       2       2       2       2       2
RATIO TO BASE       1.00    1.00    1.00    1.00    1.00    1.00    1.00    1.00    1.00    1.00    1.00    1.00
MEAN PRECIPITATION  4.82    8.90    6.36    4.94    3.96    8.53    6.47   14.45    3.49    8.67    1.47    3.56     75.63
SEASONAL PRECIP.                OCT.-APR.= 38.72          MAY -SEPT= 36.91
RMS ERROR OF ESTIMATION PROCEDURE BASED ON MONTHS WITH VALID DATA IS    .55 IN       BIAS=    .0 %

STATION   7        OWENS GAP, NC                    I.D.= NC6499D    LAT= 35.20    LONG=  82.98     ELEVATION=  3520. FT

MONTH                  1       2       3       4       5       6       7       8       9      10      11      12    ANNUAL
YEARS USED             2       2       2       2       2       2       2       2       2       2       2       2
RATIO TO BASE       1.05    1.10    1.45     .85     .92     .86     .62     .66    1.39    1.21    1.61     .91
MEAN PRECIPITATION  5.05    9.83    9.21    4.18    3.65    7.35    4.00    9.57    4.85   10.48    2.37    3.22     73.75
SEASONAL PRECIP.                OCT.-APR.= 44.34          MAY -SEPT= 29.42
RMS ERROR OF ESTIMATION PROCEDURE BASED ON MONTHS WITH VALID DATA IS    .87 IN       BIAS=    .7 %

STATION   8        PISGAH FOREST 1N, NC             I.D.= NC6805D    LAT= 35.27    LONG=  82.70     ELEVATION=  2110. FT

MONTH                  1       2       3       4       5       6       7       8       9      10      11      12    ANNUAL
YEARS USED             2       2       2       2       2       2       2       2       2       2       2       2
RATIO TO BASE       1.08    1.01    1.02     .92    1.11     .87     .73     .86     .77     .92    1.29     .92
MEAN PRECIPITATION  5.18    9.00    6.49    4.55    4.39    7.42    4.72   12.50    2.69    7.98    1.90    3.28     70.10
SEASONAL PRECIP.                OCT.-APR.= 38.38          MAY -SEPT= 31.72
RMS ERROR OF ESTIMATION PROCEDURE BASED ON MONTHS WITH VALID DATA IS    .67 IN       BIAS=    .0 %

STATION   9        ROSMAN, NC                       I.D.= NC7486D    LAT= 35.24    LONG=  82.83     ELEVATION=  2220. FT

MONTH                  1       2       3       4       5       6       7       8       9      10      11      12    ANNUAL
YEARS USED             2       2       2       2       2       2       2       2       2       2       2       2
RATIO TO BASE       1.15    1.12    1.04    1.08    1.58     .98    1.04    1.28    1.36     .87    2.05    1.46
MEAN PRECIPITATION  5.56   10.00    6.62    5.34    6.27    8.33    6.76   18.56    4.74    7.55    3.01    5.20     87.96
SEASONAL PRECIP.                OCT.-APR.= 43.30          MAY -SEPT= 44.66
RMS ERROR OF ESTIMATION PROCEDURE BASED ON MONTHS WITH VALID DATA IS   1.22 IN       BIAS=    .0 %

STATION  10        SASSAFRASS MTS, SC               I.D.= SC7737D    LAT= 35.06    LONG=  82.77     ELEVATION=  3500. FT

MONTH                  1       2       3       4       5       6       7       8       9      10      11      12    ANNUAL
YEARS USED             2       2       2       2       2       2       2       2       2       2       2       2
RATIO TO BASE       1.13    1.08    1.20    1.14    1.19    1.07    1.41     .90    1.34    1.25    2.01    1.06
MEAN PRECIPITATION  5.46    9.64    7.64    5.62    4.69    9.17    9.14   12.94    4.70   10.83    2.96    3.76     86.54
SEASONAL PRECIP.                OCT.-APR.= 45.91          MAY -SEPT= 40.63
RMS ERROR OF ESTIMATION PROCEDURE BASED ON MONTHS WITH VALID DATA IS   1.77 IN       BIAS=    .0 %

SUMMARY OF MONTHLY AND WATER YEAR PRECIPITATION.UNITS=IN

        QUEBEC, NC-HLY

WATER YEAR    10      11      12       1       2       3       4       5       6       7       8       9    TOTAL
    1960   11.62    2.67    5.32    5.93    9.09    7.38    4.60    3.85    6.10    4.59    7.53    6.88    75.56
    1961    4.55    1.72    2.07    3.39   10.86    5.30    6.60    3.64    8.44    7.85   19.18    2.57    76.17

SUMMARY       8.09    2.19    3.69    4.66    9.98    6.34    5.60    3.74    7.27    6.22   13.36    4.73    75.87

     MINUS SIGN INDICATES ESTIMATED MONTHLY VALUE.

SUMMARY OF MONTHLY AND WATER YEAR PRECIPITATION.UNITS=IN

        GLOUCESTER GAP, NC

WATER YEAR    10      11      12       1       2       3       4       5       6       7       8       9    TOTAL
    1960   14.74    3.55    5.70    8.11    9.76    7.49    3.05    4.20   11.37    2.55   11.06    5.67    87.25
    1961    5.58    2.25    2.45    4.84   10.87    6.43    7.02    5.19    9.88    5.77   18.44    1.71    80.43

SUMMARY      10.16    2.90    4.08    6.48   10.32    6.96    5.04    4.70   10.63    4.16   14.75    3.69    83.84

     MINUS SIGN INDICATES ESTIMATED MONTHLY VALUE.

SUMMARY OF MONTHLY AND WATER YEAR PRECIPITATION.UNITS=IN

        PINK BEDS, NC-HLY

WATER YEAR    10      11      12       1       2       3       4       5       6       7       8       9    TOTAL
    1960   14.18    3.22    4.97    7.46    8.33    7.97    3.56    4.02    7.08    3.55    8.34    5.07    77.75
    1961    5.42    1.73    2.36    3.51   10.39    6.31    5.75    4.84    7.45    6.17   16.91    2.17    73.01

SUMMARY       9.80    2.47    3.66    5.49    9.36    7.14    4.66    4.43    7.27    4.86   12.63    3.62    75.38

     MINUS SIGN INDICATES ESTIMATED MONTHLY VALUE.

SUMMARY OF MONTHLY AND WATER YEAR PRECIPITATION.UNITS=IN

        CEDAR MTN, NC

WATER YEAR    10      11      12       1       2       3       4       5       6       7       8       9    TOTAL
    1960   15.98   -4.63    6.75    6.34   10.99    9.38    4.45    4.40    4.43    3.08   11.49    5.05    86.97
    1961    4.71    2.22    2.53    5.54  -12.51    5.50    7.60    6.15   12.50    7.11   20.21    2.37    88.95

SUMMARY      10.35    3.42    4.64    5.94   11.75    7.44    6.03    5.28    8.47    5.10   15.85    3.71    87.96

     MINUS SIGN INDICATES ESTIMATED MONTHLY VALUE.

SUMMARY OF MONTHLY AND WATER YEAR PRECIPITATION.UNITS=IN

        HAYWOOD GAP, NC

WATER YEAR    10      11      12       1       2       3       4       5       6       7       8       9    TOTAL
```

Figure 2. Sample output from program PXPP (continued)

```
        1960  -11.47   4.70   6.86   9.86   8.12   7.08   5.25   4.59   6.55   5.14   9.46   6.28   85.36
        1961    6.87   2.84   2.84   5.21  13.95   8.57   7.32   6.88   9.24  -9.95  14.36   2.23   90.26

SUMMARY         9.17   3.77   4.85   7.54  11.04   7.83   6.29   5.74   7.90   7.55  11.91   4.25   87.81

        MINUS SIGN INDICATES ESTIMATED MONTHLY VALUE.

SUMMARY OF MONTHLY AND WATER YEAR PRECIPITATION.UNITS=IN

        BREVARD, NC

WATER YEAR     10     11     12      1      2      3      4      5      6      7      8      9   TOTAL
        1960    9.85   2.11   4.80   6.09   8.50   6.90   3.98   3.50   7.57   4.33   8.06   4.69   70.38
        1961    7.50    .83   2.31   3.55   9.30   5.81   5.90   4.42   9.49   8.61  20.85   2.30   80.87

SUMMARY         8.67   1.47   3.56   4.82   8.90   6.36   4.94   3.96   8.53   6.47  14.45   3.49   75.63

        MINUS SIGN INDICATES ESTIMATED MONTHLY VALUE.

SUMMARY OF MONTHLY AND WATER YEAR PRECIPITATION.UNITS=IN

        OWENS GAP, NC

WATER YEAR     10     11     12      1      2      3      4      5      6      7      8      9   TOTAL
        1960   14.82   2.79   4.87   6.08   8.97  11.20   2.55   3.72   5.10   3.87   8.00   7.48   79.45
        1961    6.13   1.95   1.57   4.02  10.69   7.22   5.81   3.58   9.60   4.13  11.13   2.22   68.05

SUMMARY        10.48   2.37   3.22   5.05   9.83   9.21   4.18   3.65   7.35   4.00   9.57   4.85   73.75

        MINUS SIGN INDICATES ESTIMATED MONTHLY VALUE.

SUMMARY OF MONTHLY AND WATER YEAR PRECIPITATION.UNITS=IN

        PISGAH FOREST 1N, NC

WATER YEAR     10     11     12      1      2      3      4      5      6      7      8      9   TOTAL
        1960    9.16   2.20   4.51   6.39   9.19   8.01   3.21   3.81   7.00   4.57   6.23   3.61   67.89
        1961    6.81   1.60   2.04   3.98   8.81   4.96   5.88   4.97   7.84   4.88  18.76   1.77   72.30

SUMMARY         7.98   1.90   3.28   5.18   9.00   6.49   4.55   4.39   7.42   4.72  12.50   2.69   70.10

        MINUS SIGN INDICATES ESTIMATED MONTHLY VALUE.

SUMMARY OF MONTHLY AND WATER YEAR PRECIPITATION.UNITS=IN

        ROSMAN, NC

WATER YEAR     10     11     12      1      2      3      4      5      6      7      8      9   TOTAL
        1960   10.70   3.81   8.20   7.11  10.10   7.94   4.12   5.27   4.81   3.87  12.01   7.15   85.10
        1961    4.40   2.22   2.21   4.01   9.91   5.30   6.57   7.26  11.86   9.65  25.11   2.32   90.82

SUMMARY         7.55   3.01   5.20   5.56  10.00   6.62   5.34   6.27   8.33   6.76  18.56   4.74   87.96

        MINUS SIGN INDICATES ESTIMATED MONTHLY VALUE.

SUMMARY OF MONTHLY AND WATER YEAR PRECIPITATION.UNITS=IN

        SASSAFRASS MTS, SC

WATER YEAR     10     11     12      1      2      3      4      5      6      7      8      9   TOTAL
        1960   16.19   2.99   5.06   6.02   9.82   7.79   4.47   4.57   6.75   7.49  13.05   6.76   90.96
        1961    5.47   2.93   2.46   4.90   9.45   7.50   6.77   4.82  11.58  10.78  12.83   2.63   82.12

SUMMARY        10.83   2.96   3.76   5.46   9.64   7.64   5.62   4.69   9.17   9.14  12.94   4.70   86.54

        MINUS SIGN INDICATES ESTIMATED MONTHLY VALUE.

                        PRECIPITATION CONSISTENCY CHECK.

STATIONS WITH POSITIVE NUMBERS CONSTITUTE THE GROUP BASE AND ARE PLOTTED AGAINST THE OTHER STATIONS IN THE GROUP BASE

STATIONS WITH NEGATIVE RUN NUMBERS ARE PLOTTED AGAINST THE GROUP BASE

            STATIONS IN GROUP 1

STA. RUN NO.        STATION NAME
        1           QUEBEC, NC-HLY
        2           GLOUCESTER GAP, NC
        3           PINK BEDS, NC-HLY
        4           CEDAR MTN, NC
        5           HAYWOOD GAP, NC
        6           BREVARD, NC
        7           OWENS GAP, NC
        8           PISGAH FOREST 1N, NC
        9           ROSMAN, NC
       10           SASSAFRASS MTS, SC

MONTHLY LISTING OF ACCUMULATED PRECIPITATION AND BASE PRECIPITATION.

            QUEBEC, NC-HLY      GLOUCESTER GAP, NC    PINK BEDS, NC-HLY      CEDAR MTN, NC        HAYWOOD GAP, NC
MO/YEAR     ACC. PX   BASE PX    ACC. PX   BASE PX    ACC. PX   BASE PX    ACC. PX   BASE PX    ACC. PX   BASE PX
10/1959       11.6      13.0      14.7      12.7      14.2      12.7      16.0      12.5      11.5      13.0
11/1959       14.3      16.3      18.3      15.9      17.4      16.0      20.6      15.6      16.2      16.1
12/1959       19.6      22.1      24.0      21.6      22.4      21.8      27.4      21.2      23.0      21.7
 1/1960       25.5      29.1      32.1      28.4      29.8      28.7      33.7      28.2      32.9      28.3
 2/1960       34.6      38.4      41.9      37.6      38.2      38.1      44.7      37.3      41.0      37.7
 3/1960       42.0      46.6      49.4      45.8      46.1      46.2      54.1      45.3      48.1      46.0
 4/1960       46.6      50.5      52.4      49.9      49.7      50.2      58.5      49.2      53.3      49.7
```

Figure 2. Sample output from program PXPP (continued)

```
 5/1960      50.5     54.7      56.6     54.0      53.7     54.4      62.9     53.3      57.9     53.9
 6/1960      56.6     61.5      68.0     60.2      60.8     61.0      67.3     60.3      64.5     60.6
 7/1960      61.2     65.7      70.5     64.7      64.3     65.4      70.4     64.7      69.6     64.8
 8/1960      68.7     75.5      81.6     74.0      72.7     75.0      81.9     74.0      79.1     74.3
 9/1960      75.6     81.2      87.3     79.9      77.8     81.0      87.0     80.0      85.4     80.1
10/1960      80.1     87.1      92.8     85.7      83.2     86.8      91.7     85.8      92.2     85.8
11/1960      81.8     89.2      95.1     87.7      84.9     88.8      93.9     87.8      95.1     87.7
12/1960      83.9     91.5      97.5     90.0      87.3     91.1      96.4     90.1      97.9     89.9
 1/1961      87.3     95.9     102.0     94.2      90.8     95.5     102.0     94.2     103.1     94.1
 2/1961      98.2    106.5     113.2    104.9     101.2    106.2     114.5    104.7     117.1    104.4
 3/1961     103.5    112.9     119.7    111.1     107.5    112.5     120.0    111.1     125.6    110.5
 4/1961     110.1    119.4     126.7    117.6     113.2    119.1     127.6    117.5     133.0    116.9
 5/1961     113.7    124.8     131.9    122.8     118.1    124.3     133.7    122.6     139.8    121.9
 6/1961     122.1    134.7     141.8    132.5     125.5    134.4     146.2    132.0     149.1    131.7
 7/1961     130.0    142.2     147.5    140.2     131.7    142.0     153.3    139.6     159.0    138.9
 8/1961     149.2    159.8     166.0    157.9     148.6    159.9     173.6    157.1     173.4    157.1
 9/1961     151.7    162.0     167.7    160.2     150.8    162.1     175.9    159.3     175.6    159.3
```

DEVIATION OF ACCUMULATED PRECIPITATION FROM THE GROUP BASE-----GROUP=1

```
      STA. RUN NO.      STA. PLOT NO.        STATION NAME
           1                 1               QUEBEC, NC-HLY
           2                 2               GLOUCESTER GAP, NC
           3                 3               PINK BEDS, NC-HLY
           4                 4               CEDAR MTN, NC
           5                 5               HAYWOOD GAP, NC

         ASTERISKS INDICATE ZERO DEVIATION              UNITS ARE IN

BASE PX    -39.6    -33.6    -27.6    -21.6    -15.6     -9.6     -3.6      2.4      8.4     14.4     20.4
     .0     .        .        .        .        .        .        .        *        .        .        .        .
    1.7     .        .        .        .        .        .        .        *        .        .        .        .
    3.4     .        .        .        .        .        .        .        *        .        .        .        .
    5.1     .        .        .        .        .        .        .        *        .        .        .        .
    6.8     .        .        .        .        .        .        .        *        .        .        .        .
    8.5     .        .        .        .        .        .        .        *        .        .        .        .
   10.2     .        .        .        .        .        .        .        *        .        .        .        .
   11.9     .        .        .        .        .        .        .        * 32. 4           .        .        .
   13.6     .        .        .        .        .        .        .  51 *            .        .        .        .
   15.3     .        .        .        .        .        .        .     5 3 2    4    .        .        .
   17.0     .        .        .        .        .        .        . 1  *            .        .        .        .
   18.7     .        .        .        .        .        .        .        *        .        .        .        .
   20.4     .        .        .        .        .        .        .        *  .        4      .        .        .
   22.1     .        .        .        .        .        .        . 1  *35 2          .        .        .
   23.8     .        .        .        .        .        .        .        *        .        .        .        .
   25.5     .        .        .        .        .        .        .        *        .        .        .        .
   27.2     .        .        .        .        .        .        .        *        .        .        .        .
   28.9     .        .        .        .        .        .     1     *  3 . 2 54      .        .        .
   30.6     .        .        .        .        .        .        .        *        .        .        .        .
   32.3     .        .        .        .        .        .        .        *        .        .        .        .
   34.0     .        .        .        .        .        .        .        *        .        .        .        .
   35.7     .        .        .        .        .        .        .        *        .        .        .        .
   37.4     .        .        .        .        .        .        .     3   .5 2    4 .        .        .
   39.1     .        .        .        .        .        .     1     *        .        .        .        .
   40.8     .        .        .        .        .        .        .        *        .        .        .        .
   42.5     .        .        .        .        .        .        .        *        .        .        .        .
   44.2     .        .        .        .        .        .        .        *        .        .        .        .
   45.9     .        .        .        .        .        .  1 .     3     5 2      .4        .        .
   47.6     .        .        .        .        .        .        .        *        .        .        .        .
   49.3     .        .        .        .        .        .        .        *  2 5        . 4      .        .
   51.0     .        .        .        .        .        .     1  3*        .        . 4      .        .
   52.7     .        .        .        .        .        .        .        *  .        . 4      .        .
   54.4     .        .        .        .        .        .     1.  3*    2 5      .        .        .
   56.1     .        .        .        .        .        .        .        *        .        .        .        .
   57.8     .        .        .        .        .        .        .        *        .        .        .        .
   59.5     .        .        .        .        .        .        .        *        .  42.      .        .
   61.2     .        .        .        .        .        .     1 .     3   . 5      .        .        .
   62.9     .        .        .        .        .        .        .        *        .        .        .        .
   64.6     .        .        .        .        .        .        . 3 *     . 5 4      .        .
   66.3     .        .        .        .        .        .     1 .        *        .        .        .        .
   68.0     .        .        .        .        .        .        .        *        .        .        .        .
   69.7     .        .        .        .        .        .        .        *        .        .        .        .
   71.4     .        .        .        .        .        .        .        *        .        .        .        .
   73.1     .        .        .        .        .        .        .        *        .        .        .        .
   74.8     .        .        .        .        .        .  1    . 3  *     . 5    4.        .        .
   76.5     .        .        .        .        .        .        .        *        .        .        .        .
   78.2     .        .        .        .        .        .        .        *        .        .        .        .
   79.9     .        .        .        .        .        .        .        *     5 4      .        .        .
   81.6     .        .        .        .        .        .  1 .3  *        .        .        .        .
   83.3     .        .        .        .        .        .        .        *        .        .        .        .
   85.0     .        .        .        .        .        .        .        *  452 .        .        .
   86.7     .        .        .        .        .        . 1     3     *        .        .        .
   88.4     .        .        .        .        .        . 1    3.     *     4 5.        .        .
   90.1     .        .        .        .        .        .        .        *  4 5.        .        .
   91.8     .        .        .        .        .        . 1     3     *        .        .        .
   93.5     .        .        .        .        .        .        .        *     425      .        .
   95.2     .        .        .        .        .        . 1     3 .     *        .        .        .
   96.9     .        .        .        .        .        .        .        *        .        .        .        .
   98.6     .        .        .        .        .        .        .        *        .        .        .        .
  100.3     .        .        .        .        .        .        .        *        .        .        .        .
  102.0     .        .        .        .        .        .        .        *        .        .        .        .
  103.7     .        .        .        .        .        .        .     3   . *        .        . 5  .        .
  105.4     .        .        .        .        .        .        . 3 .     *        . 2 4      .        .
  107.1     .        .        .        .        .        . 1        *        .        .        .        .
  108.8     .        .        .        .        .        .        .        *        .        .        .        .
  110.5     .        .        .        .        .        .        .        *        .  24        .5        .
  112.2     .        .        .        .        .     1     3 .     *  .        .        .        .
  113.9     .        .        .        .        .        .        .        *        .        .        .        .
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Figure 2. Sample output from program PXPP (continued)

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115.6   .        .        .        .        .        .           .      *  .         .          .  5      .
117.3   .        .        .        .        .        .           .      *  .       .2 4         :  5      .
119.0   .        .        .        .        .        1    3      .      *  .         .          .         .
120.7   .        .        .        .        .        .           .      *  .         .          .         .
122.4   .        .        .        .        .        .           .      *  .       .2    4      .    5    .
124.1   .        .        .        .        .        1  .    3   .      *  .         .          .         .
125.8   .        .        .        .        .        .           .      *  .         .          .         .
127.5   .        .        .        .        .        .           .      *  .         .          .         .
129.2   .        .        .        .        .        .           .      *  .         .          .         .
130.9   .        .        .        .        .        .           .      *  .         .          .  5      .
132.6   .        .        .        .        .        .           .      *  .       .2          4          .
134.3   .        .        .        .        .      1   .3        .      *  .         .          .         .
136.0   .        .        .        .        .        .           .      *  .         .          .         .
137.7   .        .        .        .        .        .           .      *  .         .          .         .
139.4   .        .        .        .        .        .           .      *  .        2  .       4.        5.
141.1   .        .        .        .        .        .           .      *  .         .          .         .
142.8   .        .        .        .        .      1  3.         .      *  .         .          .         .
144.5   .        .        .        .        .        .           .      *  .         .          .         .
146.2   .        .        .        .        .        .           .      *  .         .          .         .
147.9   .        .        .        .        .        .           .      *  .         .          .         .
149.6   .        .        .        .        .        .           .      *  .         .          .         .
151.3   .        .        .        .        .        .           .      *  .         .          .         .
153.0   .        .        .        .        .        .           .      *  .         .          .         .
154.7   .        .        .        .        .        .           .      *  .         .          .         .
156.4   .        .        .        .        .        .           .      *  .         .          .  5      .
158.1   .        .        .        .        .        .           .      *  .        2.          .         .
159.8   .        .        .        .        .      31  .         .      *  .        2  .         . 54      .
161.5   .        .        .        .        .      3 1.          .      *  .         .          .         .
163.2   .        .        .        .        .        .           .      *  .         .          .         .
164.9   .        .        .        .        .        .           .      *  .         .          .         .
166.6   .        .        .        .        .        .           .      *  .         .          .         .
168.3   .        .        .        .        .        .           .      *  .         .          .         .
170.0   .        .        .        .        .        .           .      *  .         .          .         .
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MONTHLY LISTING OF ACCUMULATED PRECIPITATION AND BASE PRECIPITATION.

MO/YEAR	BREVARD, NC ACC. PX	BASE PX	OWENS GAP, NC ACC. PX	BASE PX	PISGAH FOREST 1N, NC ACC. PX	BASE PX	ROSMAN, NC ACC. PX	BASE PX	SASSAFRASS MTS, SC ACC. PX	BASE PX
10/1959	9.8	13.2	14.8	12.7	9.2	13.3	10.7	13.1	16.2	12.5
11/1959	12.0	16.6	17.6	16.0	11.4	16.7	14.5	16.3	19.2	15.8
12/1959	16.8	22.4	22.5	21.8	15.9	22.5	22.7	21.7	24.2	21.6
1/1960	22.8	29.4	28.6	28.8	22.3	29.5	29.8	28.7	30.3	28.6
2/1960	31.3	38.8	37.5	38.1	31.5	38.8	39.9	37.9	40.1	37.8
3/1960	38.3	47.1	48.7	45.9	39.5	46.9	47.9	46.0	47.9	46.0
4/1960	42.2	51.0	51.3	50.0	42.7	50.9	52.0	49.9	52.3	49.9
5/1960	45.7	55.3	55.0	54.2	46.5	55.2	57.3	54.0	56.9	54.0
6/1960	53.3	61.8	60.1	61.1	53.5	61.8	62.1	60.9	63.7	60.7
7/1960	57.6	66.1	64.0	65.4	58.0	66.1	65.9	65.2	71.2	64.6
8/1960	65.7	75.8	72.0	75.1	64.3	76.0	77.9	74.5	84.2	73.8
9/1960	70.4	81.8	79.5	80.8	67.9	82.1	85.1	80.2	91.0	79.5
10/1960	77.9	87.4	85.6	86.5	74.7	87.7	89.5	86.1	96.4	85.3
11/1960	78.7	89.5	87.5	88.5	76.3	89.8	91.7	88.1	99.4	87.2
12/1960	81.0	91.8	89.1	90.9	78.3	92.1	93.9	90.4	101.8	89.5
1/1961	84.6	96.2	93.1	95.2	82.3	96.4	97.9	94.7	106.7	93.7
2/1961	93.9	107.0	103.8	105.9	91.1	107.3	107.8	105.5	116.2	104.5
3/1961	99.7	113.3	111.0	112.1	96.1	113.7	113.1	111.9	123.7	110.7
4/1961	105.6	119.9	116.8	118.7	102.0	120.3	119.7	118.4	130.4	117.2
5/1961	110.0	125.2	120.4	124.0	106.9	125.5	127.0	123.3	135.3	122.4
6/1961	119.5	135.0	130.0	133.9	114.8	135.5	138.8	132.9	146.8	132.0
7/1961	128.1	142.4	134.2	141.7	119.7	143.3	148.5	140.1	157.6	139.1
8/1961	149.0	159.8	145.3	160.2	138.4	161.0	173.6	157.1	170.5	157.4
9/1961	151.3	162.0	147.5	162.5	140.2	163.3	175.9	159.3	173.1	159.6

DEVIATION OF ACCUMULATED PRECIPITATION FROM THE GROUP BASE-----GROUP=1

STA. RUN NO.	STA. PLOT NO.	STATION NAME
6	1	BREVARD, NC
7	2	OWENS GAP, NC
8	3	PISGAH FOREST 1N, NC
9	4	ROSMAN, NC
10	5	SASSAFRASS MTS, SC

ASTERISKS INDICATE ZERO DEVIATION   UNITS ARE IN

```
BASE PX   -41.4    -35.4    -29.4    -23.4    -17.4    -11.4     -5.4      .6      6.6     12.6     18.6
    .0     .        .        .        .        .        .         .      *.        .        .        .
   1.7     .        .        .        .        .        .         .      *.        .        .        .
   3.4     .        .        .        .        .        .         .      *.        .        .        .
   5.1     .        .        .        .        .        .         .      *.        .        .        .
   6.8     .        .        .        .        .        .         .      *.        .        .        .
   8.5     .        .        .        .        .        .         .      *.        .        .        .
  10.2     .        .        .        .        .        .         .      *.        .        .        .
  11.9     .        .        .        .        .        .         .      *.  2 5   .        .        .
  13.6     .        .        .        .        .        .      . 31 4   *.        .        .        .
  15.3     .        .        .        .        .        .         .      *. 2 5    .        .        .
  17.0     .        .        .        .        .        .        31    4 *.        .        .        .
  18.7     .        .        .        .        .        .         .      *.        .        .        .
  20.4     .        .        .        .        .        .         .      *.        .        .        .
  22.1     .        .        .        .        .        .        3 1    *24 5     .        .        .
  23.8     .        .        .        .        .        .         .      *.        .        .        .
  25.5     .        .        .        .        .        .         .      *.        .        .        .
  27.2     .        .        .        .        .        .         .      *.        .        .        .
  28.9     .        .        .        .        .        .        31  .    2.45     .        .        .
  30.6     .        .        .        .        .        .         .      *.        .        .        .
  32.3     .        .        .        .        .        .         .      *.        .        .        .
  34.0     .        .        .        .        .        .         .      *.        .        .        .
  35.7     .        .        .        .        .        .         .      *.        .        .        .
  37.4     .        .        .        .        .        .         .     2*. 45     .        .        .
```

Figure 2. Sample output from program PXPP (continued)

```
 39.1    .       .       .       .       .       .    3 .       *.       .       .       .
 40.8    .       .       .       .       .       .      .       *.       .       .       .
 42.5    .       .       .       .       .       .      .       *.       .       .       .
 44.2    .       .       .       .       .       .      .       *.       .       .       .
 45.9    .       .       .       .       .       .      .       *. 5 2   .       .       .
 47.6    .       .       .       .       .       .  1 3 .       *.       .       .       .
 49.3    .       .       .       .       .       .      .       *.245    .       .       .
 51.0    .       .       .       .       .      13      .       *.       .       .       .
 52.7    .       .       .       .       .       .      .       *.       .       .       .
 54.4    .       .       .       .       .       .    3 .       *2   5   .       .       .
 56.1    .       .       .       .       .       . 1    .       *.       .       .       .
 57.8    .       .       .       .       .       .      .       *.       .       .       .
 59.5    .       .       .       .       .       .      .       *.       .       .       .
 61.2    .       .       .       .       .       .    3 .     2 *.4  5   .       .       .
 62.9    .       .       .       .       .       .      .       *.       .       .       .
 64.6    .       .       .       .       .       .      .     2 *4      5 .       .       .
 66.3    .       .       .       .       .      13      .       *.       .       .       .
 68.0    .       .       .       .       .       .      .       *.       .       .       .
 69.7    .       .       .       .       .       .      .       *.       .       .       .
 71.4    .       .       .       .       .       .      .       *.       .       .       .
 73.1    .       .       .       .       .       .      .       *.       .    5  .       .
 74.8    .       .       .       .       .       .      .     2 *.    4  .       .       .
 76.5    .       .       .       .       .    3 1       .       *.       .       .       .
 78.2    .       .       .       .       .       .      .       *.       .       .       .
 79.9    .       .       .       .       .       .      .       *.    4  .    5  .       .
 81.6    .       .       .       .       .    3 1       .     2 *.       .       .       .
 83.3    .       .       .       .       .       .      .       *.       .       .       .
 85.0    .       .       .       .       .       .      .       *.       .  5  .       .
 86.7    .       .       .       .       . 1    .       .     2 *.    4  .    5. .       .
 88.4    .       .       .       .     3 .       .       .     2 *.    4  .       .       .
 90.1    .       .       .       .     3 .1      .       .     2 *.    4  .     5 .       .
 91.8    .       .       .       .     3 .1      .       .       *.       .       .       .
 93.5    .       .       .       .       .       .      .       *.       .  .5   .       .
 95.2    .       .       .       .       .       .      .     2 *.    4  .       .       .
 96.9    .       .       .       .     3 1       .       .       *.       .       .       .
 98.6    .       .       .       .       .       .      .       *.       .       .       .
100.3    .       .       .       .       .       .      .       *.       .       .       .
102.0    .       .       .       .       .       .      .       *.       .       .       .
103.7    .       .       .       .       .       .      .       *.       .  5  .       .
105.4    .       .       .       .       .       .      .     2 *.4      .       .       .
107.1    .       .       .       .     . 3    1 .       .       *.       .       .       .
108.8    .       .       .       .       .       .      .       *.       .       .       .
110.5    .       .       .       .       .       .      .       *.       .  .5   .       .
112.2    .       .       .       .       .       .      .     2 *.4      .       .       .
113.9    .       .       .       .     3    1   .       .       *.       .       .       .
115.6    .       .       .       .       .       .      .       *.       .       .       .
117.3    .       .       .       .       .       .      .       *.       .  .5   .       .
119.0    .       .       .       .       .       .      .     2 *.4      .       .       .
120.7    .       .       .       .   3 .    1   .       .       *.       .       .       .
122.4    .       .       .       .       .       .      .       *.       .  5  .       .
124.1    .       .       .       .       .       .    . 2       *.    4  .       .       .
125.8    .       .       .       .   3 .    1   .       .       *.       .       .       .
127.5    .       .       .       .       .       .      .       *.       .       .       .
129.2    .       .       .       .       .       .      .       *.       .       .       .
130.9    .       .       .       .       .       .      .       *.       .       .       .
132.6    .       .       .       .       .       .      .       *.    4. .    5  .       .
134.3    .       .       .       .       . 1    .       . 2     *.       .       .       .
136.0    .       .       .       . 3     .       .       .       *.       .       .       .
137.7    .       .       .       .       .       .      .       *.       .       .       .
139.4    .       .       .       .       .       .      .       *.       .  4  .       5
141.1    .       .       .       .       .       .    2 .       *.       .       .       .
142.8    .       .       .     3 .       . 1     .       .       *.       .       .       .
144.5    .       .       .       .       .       .      .       *.       .       .       .
146.2    .       .       .       .       .       .      .       *.       .       .       .
147.9    .       .       .       .       .       .      .       *.       .       .       .
149.6    .       .       .       .       .       .      .       *.       .       .       .
151.3    .       .       .       .       .       .      .       *.       .       .       .
153.0    .       .       .       .       .       .      .       *.       .       .       .
154.7    .       .       .       .       .       .      .       *.       .       .       .
156.4    .       .       .       .       .       .      .       *.       .       .    4  .
158.1    .       .       .       .       .       .      .       *.       .  .5   .       .
159.8    .       .       .       .       . 2     .1     .       *.       .  .5   4  .
161.5    .       .       .     .3 .       .1     .       .       *.       .       .       .
163.2    .       .       .     .3 .       . 2    .       .       *.       .       .       .
164.9    .       .       .       .       .       .      .       *.       .       .       .
166.6    .       .       .       .       .       .      .       *.       .       .       .
168.3    .       .       .       .       .       .      .       *.       .       .       .
170.0    .       .       .       .       .       .      .       *.       .       .       .
```

```
*******************************************************************************************************

          COMPLETION CODE =  0

          CPU   TIME USED =   0 MINUTES,  5 SECONDS

          CLOCK TIME USED =   0 MINUTES,  6 SECONDS

*******************************************************************************************************
```